

A BAT INVENTORY OF ARKANSAS POST NATIONAL MEMORIAL

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Summary

Arkansas Post National Memorial was surveyed to determine bat species composition via mist nets. Four species were recorded with the most common species encountered being the evening bat and the red bat, followed by Rafinesque's big-eared bat and the eastern pipistrelle bat. All bats were captured along habitat edges and corridors. No federal or state T&E species were documented.

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Introduction

Congress passed the National Parks Omnibus Management Act in 1998 in response to concerns about the condition of natural resources within the national parks. The act requires each park to gather baseline inventory data on pertinent natural resources, data that will provide a pivotal step toward establishing an effective monitoring program furthering the ability to effectively manage and protect park resources and abide by the National Park Service (NPS) mission statement. The NPS responded with the Natural Resource Challenge program, including the establishment of biome-based inventory and monitoring networks. The Heartland Network, as part of the NPS Inventory and Monitoring (I&M) program, has undertaken inventories of vascular plants and vertebrates within fifteen parks in eight Midwestern states. Stemming from this challenge and a concern regarding the status of bat populations at Arkansas Post National Memorial, an inventory was deemed necessary to establish baseline data of bats within the park.

An inventory of bat species is a necessary first step toward understanding how bat populations relate to natural and cultural resources and associated management activities at the park. Baseline data on species composition provide a foundation for future monitoring, allow for the determination and implementation of monitoring regimes, and help better manage resources and predict the possible impacts of management decisions on bats (an important component of the National Environmental Policy Act (NEPA)).

The primary objective for this inventory was to document bat species occurring at the park. Other objectives included a qualitative assessment of species relative abundance and collection of voucher specimens for observed species.

Study Area

Arkansas Post National Memorial is located in the southeastern portion of Arkansas County, Arkansas, 11.2 km (7 mi) south of Gillett, AR. The area is characterized by a terrace landscape, flat terrain, and various stands of upland and lowland hardwoods, interspersed with bayous and swamps.

The following is excerpted from Boetsch et al 2000.

The main unit of Arkansas Post National Memorial consists of a peninsula surrounded by water, and is comprised of 157.6 ha (389.17 ac). A terrace landscape, flat terrain, and various stands of upland and lowland hardwoods, interspersed with bayous and swamps characterize the area. Also within the main unit are manicured lawns, prairie, and tall-grass areas. Moore and Post Bayous lie along the north/northwest border, and Post Lake, a backwater of the Arkansas River, lies on the north and northeastern border. Both bayous, as well as the backwater, empty into the Arkansas River along the southern edge of the main unit.

The land base of 115.8 ha (286 ac) here consists of 13 different vegetation types which range from primarily oak dominated forest stands to pine stands as well as a restored prairie and several, chronologically diverse, successional stands. Prescribed burns have been halted due to the detrimental effects of past burns, until research can be completed for several projects including fire history and cultural landscape reports. Additionally, due to past fire regimes, the canopy of the forested regions have been broken up exposing the forest floor to sunlight. These areas are subject to pronounced exotic vegetation invasions. Little is known of the effects that fire has on lowland bottomland and terrace landscapes. Therefore, fire cannot be utilized for exotic plant control at Arkansas Post National Memorial. The exotic trifoliolate orange (*Poncirus trifoliata*) has overtaken approximately 4 ha (10 ac) in the main unit and numerous areas of smaller size exist as well. Even though the quantity of exotic vegetation seems small on the main unit presently, when the land base is considered, roughly eight to nine percent of the unit is made up of exotics.

An abundance of flora and fauna resides in the park, on land and in water. The land base portion of the park has undergone sweeping changes over the past 300 years due to both natural and cultural effects but is currently, since its inclusion in the National Park System, one of the few natural strongholds left in the area. The park presents a mosaic of successional development. Land immediately adjacent to the park is either under agricultural cultivation or is being (or has been) logged. Prescribed burns, its effect on park ecosystems, and forest health are primary points of interest for resource management. Other main areas of concern include tick-borne disease frequencies, fisheries management of the ponds and bayous, bank erosion, and exotic plants and animals.

Materials and Methods

Bats were surveyed by mist-netting at a variety of locations (Figure 1). These locations were not randomized or stratified by habitat; rather, expert opinion was used to select sites most likely to capture the species expected to be in the area. Typically, 1 – 2, 4-tier, 38 mm mesh mist nets of varying lengths (dependent on the habitat being sampled) were used per site. Net locations were recorded (Lat/Lon) using an eTrex Vista Global Positioning System (GPS) portable hand-held unit with WAAS enabled accuracy less than three meters. Mist net effort was quantified based on size and number of nets set and unit effort (i.e., sq. m of net / night). Though acoustic sampling is recommended to increase the probability of detecting most bat species that may occur at the park, that sampling approach was not included in the scope of this effort.

Mist-net sampling occurred during June – early September 2004. During this period, nets opened at civil sunset and were left open for up to 5 hours, depending on capture rates. Time, date, location, weight (g), forearm length (mm), sex, and age (adult or juvenile) were recorded for captured bats, and females were examined for evidence of lactation or pregnancy. One representative individual of each captured species was kept as a voucher specimen.

All persons involved with trapping followed the American Society of Mammalogists “Guidelines for the Capture, Handling, and Care of Mammals” located at: <http://www.mammalsociety.org/committees/commanimalcareuse/98acucguidelines.PDF> Additionally, all persons directly handling bats received a pre-exposure rabies vaccine.

Results

Thirty locations (Figure 1) were trapped for a total of 42 net nights, averaging 112 sq. m of net / night. A total 29 individual bats representing 4 species were captured (Table 1). The most common species were the evening bat ($n = 12$) (*Nycticeius humeralis*) and the red bat ($n = 11$) (*Lasiurus borealis*). These species were about 4 times more common than the eastern pipistrelle bat ($n = 3$) (*Pipistrellus subflavus*) and Rafinesque's big-eared bat ($n = 3$) (*Plecotus rafinesquii*). One documented species, Rafinesque's big-eared bat, is currently being tracked and inventoried by the Arkansas Natural Heritage Commission (2004).

In every species captured, except Rafinesque's big-eared bat, adults were more common than juveniles, and males were more common than females (Table 1). No adult females of any species were found to be lactating.

All bats were captured along habitat edges or corridors. Edges were typically high contrast (i.e., there were substantial differences in composition and structure between the two habitat types forming the edge). For example, the most productive capture location was at the border of a mowed grass area and a mixed hardwood forest stand. Corridors were typically trails bisecting a forested area or narrow, linear, open areas bordered by forest.

Seven species expected to be found were not documented by this inventory (Table 2). These include: Brazilian free-tailed bat (*Tadarida brasiliensis*), big brown bat (*Eptesicus fuscus*), hoary bat (*Lasiurus cinereus*), little brown myotis (*Myotis lucifugus*), Seminole bat (*Lasiurus seminolus*), silver-haired bat (*Lasionycteris noctivagans*), and southeastern myotis (*Myotis austroriparius*).

Discussion

Four bat species were captured during this study. Evening bats and red bats were much more common than any other species encountered. However, this likely does not represent all bat species that occur on or utilize habitats at Arkansas Post National Memorial. The use of mist net surveys by themselves may not allow for adequate opportunities to record all species present. Additionally, seasonal variation and flight characteristics of different species introduce heterogeneity in capture probabilities. Finally, capture success is influenced by landscape characteristics.

Distributions of seven other species of bats suggest that they could be potentially found at the park. These species were not captured during this study for a variety of reasons. The Brazilian free-tailed bats generally aggregate in large colonies and often fly 40-50 miles in order to forage. It is possible that a large colony does not occur near the park. Big brown bats tend to fly among treetops when foraging instead of under the canopy. They also generally fly to a night time roost after about an hour of foraging. Thus, sampling with mist nets below the canopy may result in a low detection rate for this species. Silver-haired bats migrate northward in early spring, thus the time-frame of our sampling may not have been conducive to detecting this species. The hoary bat also migrates northward in early spring, and is more associated with coniferous forests than with hardwood forests such as occur at the park. Little brown myotis bats emerge from hibernation in the spring, and females generally disperse to maternity colonies in April or May. Both the Seminole bat and southeastern myotis are not as common as other species in Arkansas, and the seminole bat tends to feed at treetop level. If any of these species occur at the park, they are most likely the big brown bat, silver-haired bat, and/or little brown myotis. In order to increase the probability of detection for these species, different sampling methods (e.g., harp traps, auditory sampling) and time frames (e.g., beginning as early as late February) are recommended.

Arkansas Post National Memorial is characterized by a diverse and fragmented landscape with numerous edges, all of which is surrounded by water and agricultural areas. The prey base for bats, insect populations, thrives in this diverse environment. Additionally, several potential bat roost sites, such as mature trees and snags, are present. This situation provides a variety of habitats that are likely favorable to several bat species. Unfortunately, characteristics of this landscape also make it extremely difficult to capture large numbers of bats. Mist-net surveys for bats typically target isolated corridors or secluded bodies of water. Bat use of these areas is usually high relative to the surrounding landscape. However, corridors, edges, and water are plentiful at the park. These landscape features are dispersed throughout the area and are thus not as productive as more isolated sites.

Future bat inventory and monitoring efforts should provide for more intensive mist net surveys during March – November. They should also incorporate acoustic sampling to supplement the survey effort.

Literature Cited

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<http://www.naturalheritage.org/publications/rare/>. Accessed December 1, 2004.
- Boetsch, J.; DeBacker, M.; Hughes, P.; Peitz, D.; Thomas, L.; Wagner, G.; Witcher, B. 2000. A study plan to inventory vascular plants and vertebrates: Heartland Network, National Park Service.



Figure 1. Locations of bat mist net sites at Arkansas Post NM.

Table 1. Bat species by sex and age class at Arkansas Post NM, June – September, 2004.

Common Name	Scientific Name	Total Captured	Adult Male	Juvenile Male	Adult Female	Juvenile Female
Evening Bat	<i>Nycticeius humeralis</i>	12	4	3	3	2
Red Bat ¹	<i>Lasiurus borealis</i>	11	4	0	2	1
Eastern Pipistrelle Bat	<i>Pipistrellus subflavus</i>	3	2	0	1	0
Rafinesque's Big-Eared Bat ²	<i>Plecotus rafinesquii</i>	3	1	0	1	0
Total		29	11	3	7	3

¹ Four red bats escaped from mist nets before their sex and age class could be determined.

² One Rafinesque's big-eared bat escaped from a mist net before its sex and age class could be determined.

Table 2. List of bats and current status at Arkansas Post NM.

Common Name	Scientific Name	Old	New	Tappe
Brazilian free-tailed bat	<i>Tadarida brasiliensis</i>	1	?	No
Big brown bat	<i>Eptesicus fuscus</i>	1	1	No
Eastern Pipestrelle Bat	<i>Pipistrellus subflavus</i>	1	2	Yes
Evening Bat	<i>Nycticeius humeralis</i>	1	2	Yes
Hoary bat	<i>Lasiurus cinereus</i>	1	?	No
Little brown myotis	<i>Myotis lucifugus</i>	1	1	No
Rafinesque's Big-Eared Bat	<i>Plecotus rafinesquii</i>	1	2	Yes
Red Bat	<i>Lasiurus borealis</i>	2	2	Yes
Seminole bat	<i>Lasiurus seminolus</i>	1	?	No
Silver-haired bat	<i>Lasionycteris noctivagans</i>	1	1	No
Southeastern myotis	<i>Myotis austroriparius</i>	1	?	No

“Old” indicates the status prior the inventory, “New” the status after the inventory, and “Tappe” indicates whether the author vouchered the species. Values for Old and New follow Boetsch et al (2000): a “1” is used to indicate a species is probably present, “2” indicates a species was observed.